

Table No. 1.—Strength of Studs and Bolts (Seaton).

Dia. of Stud or Bolt.	Iron or Mild Steel.		Muntz or Gun Metal.	
	Working Stress in lbs. per square inch.	Effective Strength of one Stud or Bolt in lbs.	Working Stress in lbs. per square inch.	Effective Strength of one Stud or Bolt in lbs.
1/4 in.	2000	250	400	50
5/16 in.	2500	500	500	100
3/8 in.	3000	900	600	180
1/2 in.	3400	1450	680	290
5/8 in.	3900	2150	780	430
3/4 in.	4300	3000	860	600
7/8 in.	4700	4200	940	840
1 in.	5100	5400	1020	1080
1 1/8 in.	5500	7100	1100	1420
1 1/4 in.	5800	8500	1160	1700
1 1/2 in.	6300	11000	1260	2200
1 3/4 in.	6800	13100	1320	2620
2 in.	7000	16100	1400	3220
2 1/4 in.	7000	20400	1560	4560
2 1/2 in.	7000	26100	1730	6450
2 3/4 in.	7000	31200	1860	8300
3 in.	7000	38100	2030	11000
3 1/2 in.	7000	44800	2170	13900
3 3/4 in.	7000	53000	2350	17800
4 in.	7000	60600	2500	21800
4 1/4 in.	7000	70100	2500	26000
4 1/2 in.	7000	79500	2500	30400
4 3/4 in.	7000	90300	2500	35200
5 in.	7000	100800	2500	40400
5 1/4 in.	7000	113000	2500	46300
5 1/2 in.	7000	124600	2500	52500
5 3/4 in.	7000	138000	2500	59200

TABLE No. IV.—W. D. CRUICKSHANK'S TABLE.
For 160 lbs. sq. in. Steam Pressure.

Dia. of Bore.	Thick-ness Cop- per B.W.G.	Dia. of Flang.	Thick-ness of Flang.	Number of Bolts.	Diameter of Bolts.	Area of Flange for Joints.	Pressure on face of Flange in lbs. p. r sq. in. due to bolts.	Stress on Bolts as per Seaton's Table.	Safe stress on one Bolt as per Seaton's Table.	Pressure on Joint in lbs. per sq. in. when under Steam Pressure.
1	2	3	4	5	6	7	8	9	10	11
1 1/4	14	5 1/4	5/8	5	5/8	21.5	116	2500	500	110
1 1/2	14	5 3/4	5/8	5	5/8	23	108	2500	500	100
1 3/4	18	6	5/8	5	5/8	24.0	187	4500	900	176
2	12	6 1/4	5/8	5	5/8	26.0	173	4500	900	158
2 1/4	12	6 1/2	5/8	6	5/8	27.4	196	5400	900	178
2 1/2	12	6 3/4	5/8	6	5/8	29.0	186	5400	900	164
2 3/4	11	7	3/4	7	3/4	30.5	206	6300	900	180
3	11	7 1/4	3/4	7	3/4	32.0	197	6300	900	160
3 1/4	10	8	7/8	8	3/4	33.5	214	7200	900	181
3 1/2	10	8	7/8	8	3/4	37.0	194	7200	900	153
3 3/4	9	9	7/8	8	7/8	47.7	248	11600	1450	206
4	9	9	1	8	7/8	46	252	11600	1450	208
4 1/4	7	9 1/2	1	9	7/8	49.5	263	18050	1450	212
5	7	11	1	10	7/8	69	210	14500	1450	163
5 1/2	6	11 1/2	1	11	7/8	73.5	216	15950	1450	166
6	6	12	1	12	7/8	77.5	224	17400	1450	166
6 1/2	5	12 1/2	1 1/8	12	1	80	322	25800	2150	257
7	5	13 1/4	1 1/8	12	1	90	286	25800	2150	218
7 1/2	4	14	1 1/8	12	1 1/8	98	367	36000	3000	305
8	4	14 3/4	1 1/8	12	1 1/8	108.6	331	36000	3000	257

TABLE No. II.—PIPE FLANGES AND BOLTS—(NAGLE'S).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Dia. of Pipe.	Dia. of Flange.	No.	Dia.	Net Pressure on Gasket per 1 sq. inch.	Width of Tongue.	Net Pressure on Gasket per 1 sq. inch of Tongue.	Width of Tongue.	Inside Diameter of Tongue.	Net Pressure on Gasket per 1 sq. inch of 1 inch Tongue.	Chapman Bolts.	Crane Bolts.	Sagle Re- comments.	Net Pressure on Gasket, 1 inch Tongue, Nagle Bolts.			
3in.	9in.	6	3/4	lbs. 290	1/2	lbs. 2000	ins. 1	ins. 3 1/2	lbs. 1254	6	8	6	lbs. 1254			
3 1/2 in.	9in.	7	1	347	1/2	2000	1	4	1150	7	8	7	1150			
4	10	8	1 1/4	320	1/2	2000	1	4 1/2	1180	8	8	8	1180			
4 1/2	10 1/2	8	1 1/2	288	1/2	1800	1	5 1/4	950	8	8	8	950			
5	11	9	1 3/4	300	1/2	1857	1	5 1/2	975	9	8	9	975			
6	12	10	2	336	1/2	2057	1	6 1/4	1360	10	8	10	1360			
7	14	12	2 1/2	350	1/2	2500	1	7 1/4	1360	12	12	12	1360			
8	15	12	3	300	1/2	1600	1	8 1/4	1180	12	12	12	1180			
9	16	13	3 1/4	283	1/2	1474	1	9 1/4	1080	13	12	13	1080			
10	17 1/2	15	3 1/2	267	1/2	1250	1	11	1080	15	12	1	1110			
12	20	18	4	235	1/2	1160	1	13	965	18	16	1	1240			
14	23	18	1	231	1/2	1270	1	15	1095	18	1	1	1100			
15	23 1/2	18	1	213	1/2	890	1	16	925	18	1	20	1180			
16	25	18	1	168	1/2	618	1	17	765	18	1	20	950			
18	27 1/2	24	1	200	1	754	1	19	972	24	1	24	975			
20	29	24	1 1/8	257	1	990	1	21	1160	24	1	24	1160			
22	31	24	1 1/4	191	1	600	1	23	827	24	1	24	1450			
24	34	24	1 1/2	222	1	888	1	25	1100	24	1	24	1100			

TABLE No. V.—POPE'S FLANGES (from D. A. LOW).
For 250 lbs. Steam Pressure per sq. in.

Diameter of Bore.	Thickness of Metal in Body B.W.G.	Diameter of Flange.	Thickness of Flange B.W.G.	No. of Bolts in Flange.	Diameter of Bolts.	Area of Flange for Joints.	Pressure on Face of Flange in lbs. per sq. in.	Stress on Bolts per Seaton's Table in lbs. per sq. in.	Safe Stress on one Bolt (per Seaton's Table) in lbs. per sq. in.	Pressure on Joints in lbs. per sq. in. when under Steam Pressure.
1	2	3	4	5	6	7	8	9	10	11
1 1/2 in.	13	2 3/8 in.	18	5	3/4	33	1365	4500	900	1280
2	12	3 5/8	12	5	3/4	47	927	4500	900	790
2 1/2	11	4 1/8	11	6	3/4	66	842	5400	900	642
3	11	4 3/4	11	6	3/4	6.68	1288	8700	1450	1050
3 1/2	9	5 1/8	9	6	3/4	7.26	1185	8700	1450	874
4	9	5 7/8	9	7	7/8	8.4	1189	10150	1450	834
4 1/2	7	6 1/2	7	8	7/8	10.4	1113	11600	1450	783
5	7	7 1/8	7	8	1	11.6	1490	17200	2150	1059
6	6	8 1/4	6	9	1	14.9	1300	19350	2150	824
7	5	9 3/8	5	9	1 1/2	17.1	1570	27000	3000	1016
8	4	10 1/2	4	10	1 1/2	19.3	1545	30000	3000	908

TABLE No. VII.—C.S.R. Co.'s TABLE.

100 lbs. Steam Pressure.

Diameter of Bore.	Thickness of Metal in Body.	Diameter of Flange.	Thickness of Flange.	No. of Bolts in Flange.	Diameter of Bolts.	Area of Flange for Joints.	Pressure on Face of Flange in lbs. per sq. in.	Stress on Bolts (per Seaton) in lbs. per sq. in.	Safe stress on one Bolt (per Seaton) in lbs. per sq. in.	Pressure on Joint in lbs. per sq. in. due to Steam Pressure.
1	2	3	4	5	6	7	8	9	10	11
3 in.	1/2 in.	8 in.	3/4 in.	6	3/4	40.5	135	5400	900	117
4	3/4	9 1/2	3/4	6	3/4	54.7	157	8700	1450	136
5	1	10 1/2	1	6	3/4	63.3	136	8700	1450	106
6	1 1/8	12	1	8	3/4	79.9	144	11600	1450	109
7	1 1/4	13	1	10	7/8	88.1	162	14500	1450	122
8	1 1/2	14	1 1/8	10	7/8	97.6	147	14500	1450	97
9	1 3/4	15	1 1/8	12	7/8	105.8	162	17400	1450	105
10	2	16	1 1/4	14	7/8	114.0	176	20800	1450	109
12	2 1/2	18 1/2	1 1/4	16	1	143.1	241	34400	2150	161

TABLE No. III.—TABLE OF BOLTS, PROPORTIONS AND STRESSES.

Diameter of Bolts.	No. of Threads per inch.	Length of Spanner to D.	Effective length of Spanner to D-2.	Effective Circumference.	Theoretical pull on screw per lb. pull applied to effective part of Spanner.	Effective pull on screw per lb. applied to Spanner screw at 10% efficiency.	Area at bottom of Thread.	Pull of Bolt working stress in Seaton's Table.	Applied to Spanner to produce working stress in column 9.	Working stress in bolts per sq. inch, section at bottom of thread.	Safe twisting strength in inch lbs.	Actual twisting stress in inch lbs.	Pull in lbs. that would twist off bolt end if applied at spanner.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1/2 in.	12	8 in.	6	37	444	44	121	250	5.7	2000	84	34.2	80
5/8	11	10	8	50	550	55	203	500	9.0	2500	172	72.0	180
3/4	10	12	10	63	630	63	303	900	14.3	3000	337	148.0	187
7/8	9	14	12	75	675	67.5	421	1450	21.0	3400	550	252.0	256
1	8	16	14	88	704	70.4	534	2150	31.0	3900	826	484.0	331
1 1/8	7	18	16	100	700	70	697	3000	43.0	4300	1000	688	400
1 1/4	7	20	18	113	791	79	894	4200	53.0	4700	1700	964	436
1 1/2	6	22	20	125	750	75	1059	5400	72.0	5100	2180	1540	613
1 3/4	6	24	22	138	828	82.8	1300	7100	85.7	5500	2946	1892	746
1 7/8	5	26	24	150	750	75	1471	8500	113.0	5800	3500	2712	822
2	5	28	26	163	815	81.5	1752	11000	135.0	6300	4629	3510	997
2 1/8	4 1/2	30	28	176	792	79.2	1956	13100	165.0	6600	5620	4620	1120
2 1/4	4 1/2	32	30	188	846	84.6	2311	16100	190.0	7000	6806	5700	1310
2 1/2	4	34	32	219	852	85.2	2928	20400	239.0	7000	10000	7648	1710

Table No. VI.—Pipe Flanges (American Society of Mechanical Engineers).
For 200 lbs. Steam Pressure.

Dia. of Bore.	Thickness of Metal in Body.	Diam. of Flange.	Thickness of Flange.	No. of Bolts in Flange.	Diam. of Bolts.	Area of Flange for Joints.	Pressure on Face of Flange in lbs. per square inch.	Stress on Bolts per Seaton in lbs. per square inch.	Safe Stress on one Bolt per Seaton in lbs. per square inch.	Pressure on Joint in lbs. per square inch when under Steam Pressure.
1	2	3	4	5	6	7	8	9	10	11
2in.	4.09	6in.	5/8 in.	4	5/8 in.	28.8	85	2000	500	57
2 1/2	4.29	7	1 1/8	4	5/8 in.	32.5	68	2000	500	31
3	4.48	7 1/2	3/4	4	5/8	35.8	56	2000	500	16
3 1/2	4.66	8 1/2	1 1/8	4	5/8	45.9	44	2000	500	1.7
4	4.86	9	1 1/4	4	3/4	49.2	74	3600	900	22
4 1/2	4.98	9 1/4	1 1/8	8	3/4	47.7	153	7200	900	84
5	5.25	10	1 1/8	8	3/4	55.3	132	7200	900	59
6	5.62	11	1	8	3/4	63.2	115	7200	900	24
7	6.0	12 1/2	1 1/8	8	3/4	80.6	90	7200	900	17
8	6.39	13 1/2	1 1/2	8	3/4	89.3	82	7200	900	-32
9	6.78	15	1 1/2	12	3/4	107.7	101	10800	900	-17
10	7.13	16	1 3/8	12	7/8					